Serious Games and Virtual Worlds for High-level Learning Experiences

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Abstract. The present research aims to discuss the role of serious games and virtual worlds as emerging technologies leading to high-level learning experiences. A review of theoretical concepts for knowledge acquisition and learning is provided, focusing on the role of personal experiences and trial-anderror methods. Some of the basic characteristic of serious games and virtual worlds have been reviewed and their main advantages and limitations for elearning are discussed. Thus a model for interactive virtual environment, integrating SG&VW and e-Learning is proposed, aiming to deliver high-order learning experiences. Finally the paper discovers some of the main limitations of SG and VW in practice and provide a number of considerations for their wider integration in the learning process.

Keywords: serious games, virtual worlds, e-learning virtual environments

1 Introduction

Information technologies become important component in education, as habile mastering of ICT is indispensable for new generations, and specialized IT solutions can improve learning process. However, many educators today use ICT mainly to deliver training materials[2]. Thus interactivity is low and education process remain "owned" by trainers.

The present research aims to discuss the role of serious games (SG) and virtual worlds (VW) in education in order to attain high-order learning. SG and VW can both attract young generations, delivering an open IT platform to train a new set of skills and knowledge in interactive form. Thus SG and VW can enrich learning context and content, proposing environment beyond physical, geographical and economic limitations, suitable for experiments, active interactions, group work, scenarios testing, learning-by-doing and explorative learning methodologies. An overview of SG and VW benefits for learning process will be proposed, including active learning and first-hand knowledge acquisition through personal experience and trial-and-error methods.

2 Theoretical background

Learning enable people to acquire competences, skills and knowledge in order to cope with challenges and to make rational decision. Moreover, learning forms attitudes, perspectives, insights, and understandings, enabling learners to perform desired functions with proficiency[4]. Personal experience

and method of trial and errors represent substantial component of learning and knowledge acquisition. This is proved in the definition of knowledge 'a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experience and information'[5]. Moreover, knowledge is only "expectation or assumption about the reality, acquired trough number of trial and errors experiences"[6]. While explicit knowledge can be easily articulated in formal language and transmitted with electronic tools, tacit knowledge is sub-conscious knowledge embedded in individual experiences, difficult to formalize and articulate, and is developed through a process of trial and error encountered in practice [8]. Thus, the most powerful learning comes from direct experience [10], and proactive, experience-gaining learning is better than reactive and passive learning [9].

The Kolb's learning cycle [11] is one of the most enduring learning models, focusing on learning by doing and evaluation of learning experiences [12]. The Kolb model comprise 4 stages [11]: Gain experience; Review of experience and reflection on outcomes and feedback; Theorizing about what happened and why, exploring options and alternatives; Planning what to do differently next time, looking for practical applications of ideas, finding opportunities to implement. Thus, according to [12] the main learning processes are: theory input, practical experience, application of theory and idea generation. E-learning is defined as an additional and complementary channel of communication allowing computers and computer networks to connect learners with learning media, with other people (fellow learners, sources, facilitators), with data (about learning, about media, about people) and with processing power [14]. E-learning technologies can perform customized, cheaper, flexible and learner – oriented training, reflecting personal attitudes and allowing new type of learning process. Although the popularity of e-learning, practitioners report lack of interactivity, low contextualization, lack of simulations and in fact e-learning serve traditional learning methodologies mainly as mediums for dissemination of learning materials.

3 Implementation of SG and VW in e-learning

SG are commonly defined as (digital) games used for purposes other than mere entertainment or fun [16,17]. SG usually refer to games used for training, advertising, simulation, or education, designed to run on personal computers or video game consoles. There can be distinguished several classes of SG - concerning idea, players, and development[19]. Another classification of [20] distinguish SG according to application - military games, government games, educational games, corporate games, healthcare games, and political, religious and art games.

The common elements of SG include: back story (plot/ story line), game mechanics (physical functions/actions), rules (constraints), immersive environment (including 2D/3D, animations), interactivity (impact of player's actions), and challenge/competition (against the game or against other players). In SG players have to perform a set of actions and take different decisions, following preliminary defined rules and constraints. Usually players receive instructions and feedback on their performance and are virtually assisted with additional learning materials.

VW are open-ended virtual realities, consisting of four components: "3D environment, community, creation and commerce" [21]. VW can be structured or unstructured [22]. Among the elements of VW can be identified: presence in a space; interaction in real time with other individuals; persistence, environment and 3D objects; representation of online personality via an avatar; Nowadays there exists more than 300 virtual worlds as Second Life@, Active Worlds@, Kaneva@, HabboHotel@, Whyville@, Club Penguin@. The experimentation and learning with 3D simulations and VW have been largely applied in specific industries of high risk and huge potential loss, such as rocket science, airplanes and flight simulations, trucks, submarines and others.

4 Discussion

Adoption of interactive pedagogical methods are essential for providing high-level learning experience and knowledge. Following the Kolb learning cycle, SG and VW enable learners to gain experience, to get feedback and assessment of their performance. However to build theoretical knowledge and to plan further actions learner will need more extended e-learning solutions. Thus there is derived a model of interactive learning system combining the model of Kolb and SG, as illustrated on Fig.1.

Basic features of SG and VW could be very useful in acquiring hierarchical sequence of skills [13], integrating affective and psychomotor skills in e-learning and allow students to develop high-order learning experiences[26].

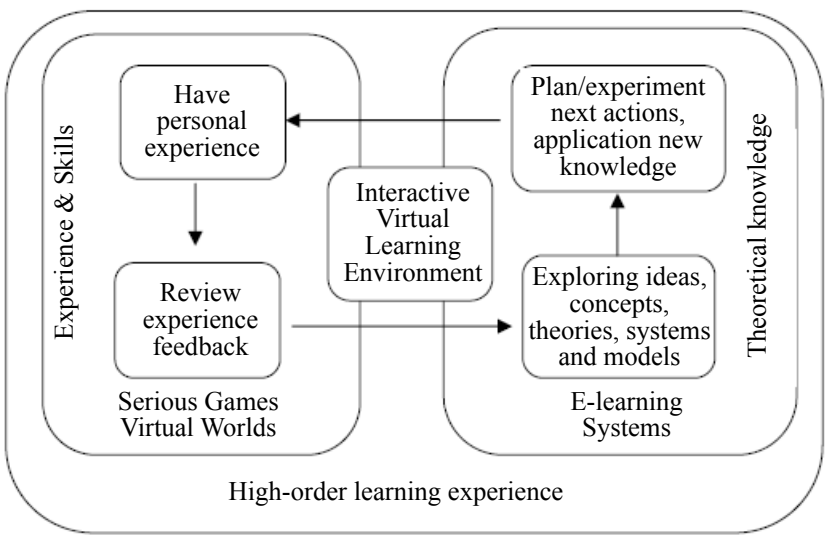

Fig. 1. Model of Interactive virtual environment, integrating SG&VW and e-Learning.

SG and VW offer many advantages for learning [24], but their wider implementation in education depends from many factors. Its main benefits are that they employ popular "entertainment" approach to build experience in stimulating, user-centered environment and motivate learners to achieve better results. Players "invest something of themselves in a game or learning experience as

they fully engage with the role" [18]. This 'personal investment' is a critical factor in achieving high-level learning experience. Thus SG and VW can be successfully applied both in blended learning and in distance learning, improving its accessibility for disable people.

Moreover, it should be stated that SG and VW require additional efforts and skills from instructors to attain positive educational experiences, meaning both personal involvement and investments in time. These substantial efforts makes SG and VW more difficult to adopt in education and in e-learning [18] and requires efforts and preliminary preparation, which increase the price of learning.

Thus the positive learning outcomes largely depends on how SG and VW are integrated in practice. Thus the application of SG and VW in education should be carefully prepared and based on sound methodological principles: the value of technology use for education, resources for its implementation in class, is it fitting with the goals of the curriculum, and how can be evaluated learning outcomes.

5 Conclusion

Emergence of SG and VW propose new IT solutions with increased potentials for active learning, enhancing learners' experience and improving knowledge acquisition. SG and VW propose many advantages to enhance traditional training methodology in order to create new forms of learning experiences. Combining the learning cycle of Kolb with SG and VW and e-learning technologies can contribute for new model of enhanced interactive learning environments. The aim is to achieve high-order level thinking and learning in different domains of science. Development and integration of SG and VW in learning is the next tasks of e-learning experts. However, new technologies will require additional efforts as instructors and trainers will have to leave their role of knowledge providers and transform to facilitators of complex learning processes, organizing and guiding unique learning experiences. Future research will explore positive practices of SG and VW in e-learning focusing on evidences for improved learning experiences and complex skills and competences acquisition.

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